IGARSS'95

# SIR-C/X-SAR: A Multi-Faceted Radar

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The Spaceborne Imaging Radar-C/X-band Synthetic Aperture Radar (SIR-C/X-SAR) was a joint US/German/Italian project, with flights aboard the shuttle Endeavour in April and October 1994. SIR-C/X-SAR is the first spaceborne multi-frequency, multi-polarization radar. SIR-C operated in it's standard modes at L-band and C-band (selectable) with VV,VH,HV,HH polarization (selectable), using an active phased array antenna with electronic boresite steering and beamwidth adjustment in elevation. Experimental modes were also implemented, including **SCANSAR,** azimuth tracking, high resolution and interferometric SAR. The X-SAR operated at X-band with a single polarization (VV) and an antenna steerable in elevation. The SIR-C and the X-SAR were designed to operate in conjunction with each other, collecting data over common sites. A total of 143 hours of data at 180 Mbps (about 93 terabits) were digitally recorded on tape during the two missions. Post-mission survey and precision processing are being accomplished using specially developed digital processors for SIR-C in the U.S. and for X-SAR **in Germany and Italy. Scientists around the world are using the data** in conjunction with ground measurements to conduct experiments relating to the Earth's ecology, geology, hydrology and oceanography. In addition, the data are **the most** comprehensive set yet available for engineering characterization of spaceborne SAR capabilities relative to various radar phenomenology and methodology. The scientific experiments and engineering assessment will take advantage of the diversity of the SAR instrument modes, viewing geometries, terrains, surface covers and variable repeat-pass intervals available from the SIR-C/X-SAR mission, coupled with extensive corroborating ground measurements. A key feature of SIR-C/X-SAR is the level of calibration achieved. Radiometric correction factors were implemented in the processors and the end-to-end accuracy was verified by ground measurements. Preliminary results show changes between missions in vegetation, ice, snow, flooding, and volcano activity. The interferometric data are of particular science and engineering interest, since they will allow assessment of repeat-track topographic mapping at three frequencies, over various terrains and covers, at time intervals of 1 day to 6 months, and with varying baselines. In addition, surface cover penetration as a function of frequency and polarization is another area of particular interest as a phenomenon unique to the lower end of the remote sensing spectrum. The results will allow quantification of the radar utility for a variety of applications.